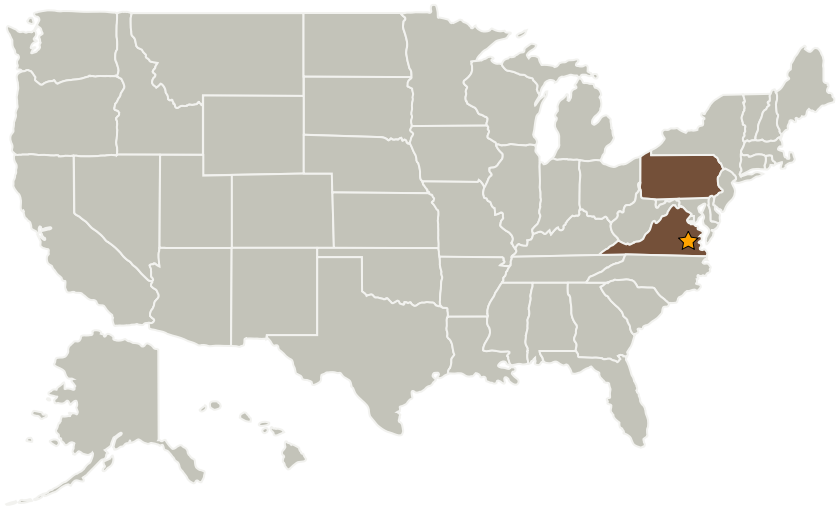
Cryogenic Stepping Piezomotor for Large Torque, Precise Rotary Motion Control in Passive Optics, Phase I

Completed Technology Project (2007 - 2007)

Project Introduction

TRS Technologies proposes novel single crystal piezomotors for large torque, high precision, and cryogenic actuation with capability of position set-hold with power-off for passive optics platforms. The proposed concept will advance the state-of-art cryogenic rotary motors considering the excellent cryogenic properties of single crystal piezoelectric. This material exhibits d33 and d31 at 30K similar or higher than that of PZT at room temperature and it has a very high electromechanical coupling. These properties result in an excellent figure of merit for resonant devices. TRS and Va. Tech. will use single crystals to fabricate "wobbling mode" and "flexural traveling wave" piezomotors with "33 mode" single ring stacks and plate stacks instead of the conventional "31" mode plates for excitation. In the Phase I project, FEA modeling considering the special properties of single crystals will be conducted and novel piezomotors with "33" mode single crystal ring and plate stacks will be built and characterized at temperatures from 300K to 80K. By the conclusion of Phase I program the feasibility of single crystal piezomotor for cryogenic rotary motion control requiring large torque and high angular resolution will be demonstrated. The optimum single crystal piezomotor design and the precise cryogenic rotary motion control system development will take place in Phase II.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
Pennsylvania	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.1 Heat Acquisition